

CHAMP and SAC-C Atmospheric Occultation Results and Intercomparisons

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Abstract

The German CHAMP and Argentinian SAC-C missions, both launched in year 2000, carry the new generation "BlackJack" GPS receivers capable of collecting high-quality occultation measurements even when the GPS signal is encrypted. The presence of two missions, each collecting nearly 200 daily occultations, presents the first opportunity to test the precision, and to some extent the accuracy, of GPS occultation measurements for the purpose of assessing two very important claims regarding GPS occultation measurements: GPS occultation are unbiased and have ~ 0.5 accuracy between ~ 5 -20 km. Both of these claims are revolutionary from a climate standpoint, because, if proven, they imply that measurements taken today can be compared to measurements taken a decade later to detect small temperature variation without having to worry about instrument biases or calibration. We will present inter-comparisons between CHAMP and SAC-C and between these satellites and weather analysis and radiosonde measurements. These comparisons are done on individual cases and statistically and demonstrate a precision level on CHAMP and SAC-C at 0.1K in the mean and 0.5K in standard deviation between 5-20 km. On the other hand, radiosonde and weather analysis demonstrate biases of order 0.5K and temperature differences of order 1-2K relative to both CHAMP and SAC-C. The BlackJack receiver also has an advanced tracking loop known as "fly wheeling" for improving tracking in the lower troposphere. Our presentation will also examine the degree of success in sensing the lower troposphere with these missions.